

• PCMCIA Primer

A Brief Background

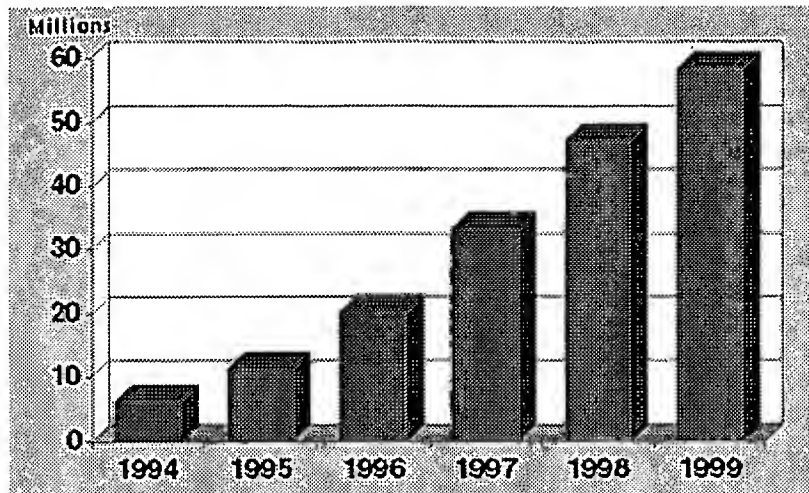
With the proliferation of portable computer systems such as notebooks, sub-notebooks, palmtops, and PDAs, it became apparent that portable expansion devices would also be required. Prior to any expansion card standards, computers were often designed to accept peripheral devices such as add-on memory and modems which were proprietary and unique only to them and excluded the use of similar devices made by other manufacturers. Many devices such as modems were designed to plug only into a specific computer model and therefore were excluded from the same manufacturers' other models. Generally, these peripheral devices were not designed to be exchanged with other computers, but rather were an installed option which would remain only with the computer in which they were originally installed.

As a result a common expansion method was needed for general use in the industry in order for computer manufacturers to be able to standardize each machine's expansion capability. This approach would allow computer users to select add-ons from multiple vendors and also to share peripherals with other computer users. Originally these devices were primarily memory cards. These memory cards were sometimes used in lieu of floppy diskettes to exchange data or to expand the memory of the computer system. As the functionality of these cards expanded beyond memory cards, they would eventually become analogous to the many types of expansion cards that are plugged into the motherboard of a desktop computer system. Their ease of use, compact size, cross platform compatibility, and varied applications would eventually have a great influence on their increased popularity.

In pursuit of an industry standard, the Personal Computer Memory Card International Association (PCMCIA) was formed by several card manufacturers in the late 1980s to define the card's physical design, computer socket design, electrical interface, and associated software. PCMCIA used some of the Japanese Electronic Industry Development Association's (JEIDA) principles in developing their standard. Both organizations continue to support international standards for PC Cards as they are now called. In fact, the newest release of the standard incorporates both PCMCIA and JEIDA developments which further enhances compatibility between products. PC Cards are now used in many varied applications including several types of RAM memory, pre-programmed ROM cards, modems, sound cards, floppy disk controllers, hard drives, CD ROM and SCSI controllers, Global Positioning System (GPS) cards, data acquisition, LAN cards, pagers, etc. Still in an early stage of development, the PCMCIA market is projected to grow at a healthy rate.

Worldwide PC Card Shipments

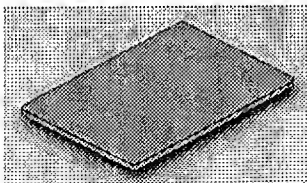
Type I, II and III Cards



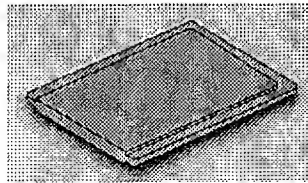
Source: AP Research 1995

The PCMCIA standard allows for the PC Card to be used with many computer types regardless of microprocessor type. Not only can PC Cards be used with many types of computers, they are also suitable for use in other digital applications such as test equipment, digital imaging equipment and industrial controllers. This has worked to the advantage of system manufacturers, peripheral manufacturers, resellers and system users in many different environments.

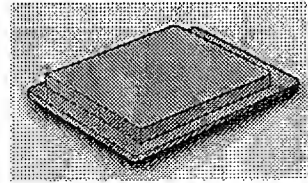
PC Cards follow specifications governing size, power, signal, and software standards for compatibility and portability between various systems. There are currently three standardized PC Card physical form factors: **Type I** is the original 3.3 mm thick card, **Type II** expands the thickness to 5.0 mm, and **Type III** further expands the thickness to 10.5 mm. Generally speaking, Type I cards have been used almost exclusively for memory devices. However, modems and other devices have appeared in Type I. Type II cards are by far the most predominant size today and are used for most functions with the exception of a few special applications. The thicker Type III cards are used primarily for miniature hard drives. Since all three card form factors share an identical bus connector, the thinner cards can be installed in computer slots designed for thicker card formats.



Type I



Type II



Type III

The PCMCIA standard has evolved over time and is now in its third release. Changes and improvements have been necessary to accommodate the changing demands that the marketplace places on system and PC Card suppliers. Remember that the PCMCIA standard has grown considerably beyond its original scope of defining memory cards.

Release 1.0 was the original release and established standards aimed at memory cards modeled after existing RAM cards. **Release 2.0 - 2.1** included Card and Socket Services software specifications, ATA, and AIMS specifications. (ATA stands for AT Attachment and refers to the IDE drive interface on a PC Card. AIMS stands for Auto Indexing Mass Storage. AIMS is the standard for storing image and multimedia data on a PC Card and is used typically for camera applications.) The latest release, **PC Card Specification - February 1995**, (sometimes incorrectly referred to as Release 3.0) includes enhancements for DMA (Direct Memory Access), multi-media at higher speeds, plug and play concepts, multi-function cards, and CardBus. This latest release also enables cards and systems to be designed using 3.3 Volt logic which is becoming increasingly popular due to the energy savings for battery operated devices. With each release of the PCMCIA standard, efforts have been made to maintain backward compatibility with PC Cards designed to earlier releases of the standard.

CardBus has redefined and enhanced the PCMCIA bus structure while still being able to revert back to the standards specified in Release 1 and 2. The main purpose of CardBus is to extend the PCMCIA bus to higher speeds with more powerful devices, and to provide support of 32 bit I/O and memory data paths. It incorporates a new shielded bus connector and CardBus cards will not plug into the previous generation systems designed for Release 2.x or earlier.

Socket Most newer computer systems that have PC Card slots use both Card and Socket Services software which provide a standardized software interface between the computer and the PC Card itself. To draw an analogy, Card and Socket Services are to PC Cards what DOS and the BIOS are to the base PC system. Basic systems may use only Socket Services to interface to the PCMCIA hardware and require special drivers for each type of PC Card used. Since Windows 95, most Windows have the functions of Card and Socket Services embedded. It seems that this will be the trend for the future, if for no other reason, to minimize installation difficulties. Separate device drivers for some PC Cards will always be needed however, since no operating system could anticipate all functions and configurations of the future's PC Cards.

Most computer systems are also designed to hot swap the PC Card (removal and insertion of the card with the computer power turned on), meaning that users can connect or disconnect the device without interrupting their work in progress or requiring exiting the software in use. For example, the user could unplug his modem card and reinsert a RAM card without shutting down his computer. When the new card is installed, the computer's socket hardware notifies the software and the system is then configured to properly accept the new peripheral. Conversely, when the card is removed, the hardware detects the removal and informs the software that the card is no longer installed and the appropriate actions are taken automatically. Most systems will give a familiar beep sound from the computer's speaker when the card is either removed or inserted.

The specifications that are adhered to by PC Card manufacturers are designed to ensure compatibility, however computer users should be aware that many older computer systems are not always up to date with the latest revisions of software (for Card and Socket Services support). In some cases this may cause compatibility problems with newer PC Cards when used with early versions of Card and Socket Services software. If you are using such a system, you would be well advised to update your computer's Card

and Socket Services or, if necessary, Windows operating system, when first installing a new PC Card.

PC Card Development

Many people already involved in expansion cards for computers have seen the PCMCIA standard as an opportunity to expand their product lines to include the rapidly growing portable computer market. These efforts have been fueled by the market which often demands that their notebook have all the functions of a well equipped desktop. Some have been very successful with their PC Card offerings, while the strategy has been very difficult for others. Building successful PC Cards is not without its pitfalls. The market has proven to be very competitive, especially for popular items such as hard drives, modems, and memory cards. On a technical level, a detailed understanding of the PCMCIA standard is required as well as a good understanding of the various implementations (both hardware and software) of the installed base. It is for this reason that various companies offer testing services to ensure compatibility of new PC Cards with a variety of computer systems and software.

New development tools are also required. Naturally, many companies have stepped in to fill the voids, and some good tools are available. Accurite has a small offering of very practical and inexpensive tools for designers and manufacturers which can be seen in our Products & Services page.

The following standards organizations may be contacted by PC Card designers and developers to request the latest information concerning PC Card specifications, etc.:

PCMCIA	JEIDA
2635 North First St. - Suite 209 San Jose, CA 95134 USA Telephone (408) 433-2273 Fax (408) 433-9558 BBS (408) 433-2270 E-Mail office@pcmcia.org http://www.pc-card.com	Kikai-Shiko Building Room No. 406, 4th Floor, 314 3rd Floor 3-5-8 Shiba-Koen Minatu-Ku, Tokyo 105 Japan Telephone 81-3-3433-1922 Fax 81-3-3433-6350 http://www.jeida.or.jp

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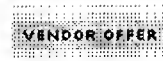
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A PCMCIA card is a credit card-size memory or I/O device that connects to a personal computer, usually a notebook or laptop computer. Probably the most common example of a PCMCIA card is the 28.8 Kbps modem for notebook computers.

The Personal Computer Memory Card International Association was organized in 1989 to promote standards for both memory and I/O integrated circuit cards. The PCMCIA 2.1 Standard was published in 1993. As a result, PC users can be assured of standard attachments for any peripheral device that follows the standard.

A PCMCIA card has a 68-pin connector that connects into a slot in the PC. There are three sizes (or "Types") of PCMCIA cards:

Type	Thickness (mm)	Typical use
I	3.3	Memory
II	5.0	Modems, LANs, SCSI, sound
III	10.5	ATA hard drive

The Type I and II cards work in a Type III slot and a Type I card will work in a Type II slot. (On the other hand, the thicker cards can't be fitted into the slots for the thinner cards.)

The PCMCIA standard is most commonly applied to portable PCs but it can also be used on desktop computers. The PCMCIA card is not to be confused with another credit-size electronic card, the *smart card*.

Last updated on: Mar 31, 2003

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